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10/077,633	02/15/2002	Thomas G. Thundat	920976.90172	5479

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EXAMINER	
NOGUEROLA, ALEXANDER STEPHAN	
ART UNIT	**PAPER NUMBER**
1753	

DATE MAILED: 01/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/077,633	THUNDAT ET AL.	
	Examiner	Art Unit	
	ALEX NOGUEROLA	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 November 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *24-56* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *24-56* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 November 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicants' amendment of October 29, 2004 ("Amendment") does not render the application allowable.

Response to Arguments

2. Applicant's arguments with respect to claims 1-23 have been considered but are moot in view of the new grounds of rejection. The examiner would like note the following

Gurtner

Applicants state, "Gurtner et al. does not disclose the apparatus or methods of all of the claims that include an electrically conductive layer having at least two different molecules that are undergoing separation. Instead, Gurtner et al. is directed to moving molecules to an illuminated area without separation." See page 13 of the Amendment. With regard to the apparatus claims, Applicants comments and relevant claim language are only intended uses that do not further patentably provide a structural difference in Applicants' claimed invention over Gurtner, especially since Gurtner discloses photo*electrophoresis*, electrophoresis being a known separation technique. With regard

to the method claims, there is no separating step as such only induced migration. "Migration" is not synonymous with "separation."

Kakutani

Applicants state, "... Kakutani et al. does not disclose an apparatus or method whereby a surface of an electrode is irradiated with a light source. Instead, the purpose [of] the light provide in Kakutani et al. is absorbed by molecules in solution. Thus, Kakutani et al. does not anticipate the currently claimed invention at least because:

● The photon energy source is not incident upon the claimed seminconductor; and

● No photopotential is generated at the surface of the semiconductor." See page 14 of the Amendment.

The examiner respectfully disagrees. Figure 2 graphically shows a photon energy source (105a) incident upon the semiconductor (101a) and a photopotential being generated at the surface of the semiconductor (col. 3:64 – col. 4:22).

Ozkan

The declaration filed on September 17, 2004 under 37 CFR 1.131 is sufficient to overcome the Ozkan reference.

Status of the Objections and Rejections pending since the Office action of June 11, 2004

3. All of the objections to the drawings are withdrawn.

4. All of the objections to the specification are withdrawn.

5. All of the objections to the claims are withdrawn.

6. The rejections of claims 1-6, 8-12, 17-21, and 32 under 35 U.S.C 102(b) as being anticipated by Gurtner are withdrawn, but this reference has been applied to several claims added by Applicants' Amendment.

7. The rejections of claims 1, 3-6, 13-15, and 17-21 under 35 U.S.C 102(b) as being anticipated by Kakutani are withdrawn, but this reference has been applied to several claims added by Applicants' Amendment.

8. The rejections of claims 1, 3, 4, 10, 11, and 13-15 under 35 U.S.C 102(a) as being anticipated by Ozkan are withdrawn.

9. The rejections of claims 7 and 22 under 35 U.S.C 103(a) as being obvious over Gurtner in view of Hafeman are withdrawn, but this combination of references has been applied to several claims added by Applicants' Amendment.

10. The rejections of claims 13-15 under 35 U.S.C 103(a) as being obvious over Gurtner in view of Ozkan are withdrawn.

11. The rejection of claim 16 under 35 U.S.C 103(a) as being obvious over Gurtner in view of Ozkan and Jiang is withdrawn.

12. The rejection of claim 16 under 35 U.S.C 103(a) as being obvious over Ozkan in view of Ozkan and Jiang is withdrawn.

Claim Rejections - 35 USC § 112

13. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

14. Claims 24-56 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention:

a) Claim 24: the statutory class of invention of this claim is indefinite. The preamble to claim 24 stats that the claim is directed to an apparatus; however lines 5-6 require "the electrically conductive further including at least two different molecules that are being separated by the apparatus." This is a method of use limitation. Since patentability, at least over Gurtner, depends on this limitation (that is, on how the apparatus is used), Applicants are suggested to clearly recast claim 24 and claims that depend therefrom as method of use claims;

b) Claim 24 recites the limitation "the electrolyte medium" in lines 15-16. There is insufficient antecedent basis for this limitation in the claim;

c) Claim 24 appears to have an inconsistency. Lines 4-6 require "an electrically conductive layer located between an in contact with the semiconductor and the counter electrode." However, lines 7-8 require "an interface located between the semiconductor material layer and the electrically conductive layer." How can the interface (if it is a distinct layer) be between the semiconductor layer and the electrically conductive layer if the electrically conductive layer is in contact with the semiconductor layer?

d) Claim 40: isn't an electrode electrically conductive by definition?

e) Claim 44 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting an essential step, such omission amounting to a gap between the steps. See

MPEP § 2172.01. The omitted step is that of separating the charged molecules. The body of claim 44 only requires migrating the molecules (last paragraph).

15. Note that dependent claims will have the deficiencies of base and intervening claims.

Claim Rejections - 35 USC § 102

16. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

17. Claims 24-38, 40 are rejected under 35 U.S.C. 102(b) as being anticipated by Gurtner et al. ("Photoelectrophoretic transport and Hybridization of DNA Oligonucleotides on Unpatterned Silicon Substrates," *Journal of the American Chemical Society*, volume 122, number 36, September 13, 2000) ("Gurtner").

Addressing claim 24, Gurtner discloses an apparatus for transporting molecules (abstract), said apparatus comprising:

a semiconductor material layer (Mn_2O_3 modified silicon layer in Figure 1);

a counter electrode (Pt auxiliary electrode);

an electrically conductive layer (electrolyte) located between and in contact with the semiconductor and the counter electrode;

an interface located between the semiconductor material layer and the electrically conductive layer (agarose layer);

a voltage source electrically coupled to the semiconductor and the counter electrode wherein the voltage source applies a voltage potential across the interface to thereby generate a depletion region in the semiconductor (implied by the caption to Figure 1, for example, which states, "In presence of *applied potential*, these *electron holes* generate a photoelectrochemical current that causes ...[emphasis added]"); and

at least one photon energy source incident upon the semiconductor having the depletion region wherein the photon energy source generates photon energy sufficient to form electron hole pairs that are separated by the voltage potential depletion region thereby generating a photopotential at the surface of the semiconductor material causing charged molecules in the electrolyte medium in contact with the semiconductor material to move in response to the localized voltage (Figure1 and its caption), wherein at least one of the photon energy source and the semiconductor is movable relative to the other (Experimental Setup (Figure 1) in second column on page 8590, ""Sample illumination ... was accomplished by a single-mode optical fiber .. mounted on a motorized micromanipulator stage ...").

Gurtner does not mention using the apparatus for separating molecules; in particular Gurtner does not mention having "the electrically conductive layer further including at least two different molecules that are being separated by the apparatus." However, this is intended use of the apparatus that does not further patentably distinguish the claimed invention from that of

Gurtner, especially since the apparatus of Gurtner is capable of such a use (it performs photoelectrophoresis).

Addressing claim 25, Gurtner discloses at least Si as a semiconductor material. See Figure 1.

Addressing claim 26, in Gurtner the electrically conductive layer is a fluid film (note paragraph [0030] in Applicants' specification).

Addressing claim 27, note the agarose shown in Figure 1.

Addressing claims 28, 35, and 40, for the limitations of these claims see Figure 1.

Addressing claims 29-34, for the limitation of these claims see Experimental Setup (Figure 1) in the second column on page 8590. For claim 31 note the filter wheel. For claims 31-33 note that these claims only provide intended use limitations that unless shown otherwise do not *structurally* modify the claimed apparatus.

Addressing claims 36 and 38, note that these claims only provides an intended use limitation that unless shown otherwise does not *structurally* modify the claimed apparatus.

Addressing claim 37, an artificial pattern may be seen in Figures 4 and 5.

18. Claims 24-26, 28-36, 38-42, 44-46, 48, 49, 51, 55, and 56 are rejected under 35 U.S.C. 102(b) as being anticipated by Kakutani et al. (US 5,151,741) ("Kakutani")

Addressing claim 24, Kakutani discloses an apparatus for separating molecules (abstract - toner selection), said apparatus comprising:

a semiconductor material layer (101a and col. 7:56-59);

a counter electrode (202);

an electrically conductive layer (electrolyte 103) located between and in contact (physical or electrical) with the semiconductor and the counter electrode, the electrically conductive layer further including at least two different molecules that are being separated by the apparatus (Figure 2 col. 5:49-55);

an interface located between the semiconductor material layer and the electrically conductive layer (interface between 101b and 101a in Figure 2. Note laser beam 210 being scanned along this interface);

a voltage source (207) electrically coupled to the semiconductor and the counter electrode wherein the voltage source applies a voltage potential across the interface to thereby generate a depletion region in the semiconductor (implied by col. 5: 6-12 and col. 5: 56-63) and

at least one photon energy source (210) incident upon the semiconductor having the depletion region wherein the photon energy source generates photon energy sufficient to form electron hole pairs that are separated by the voltage potential depletion region thereby generating a photopotential at the surface of the semiconductor material causing charged molecules in the electrolyte medium (103) in contact with the semiconductor

material to move in response to the localized voltage (Figure 2 and col. 6:10-38), wherein at least one of the photon energy source and the semiconductor is movable relative to the other (implied by col. 6:6-9, which discloses scanning the laser beams. Also see col. 8:41-42).

Addressing claims 25 and 45, Kakutani discloses at least Si as a semiconductor material. See Figure 1.

Addressing claims 26 and 46, in Kakutani the electrically conductive layer is a fluid film (note paragraph [0030] in Applicants' specification).

Addressing claim 28, for the limitation of this claim see Figure 2.

Addressing claims 29-34 and 52, for the limitation of these claims see col. 6:6-13. For claim 31 note the selective targeting. For claims 31-33 note that these claims only provide intended use limitations that unless shown otherwise do not *structurally* modify the claimed apparatus.

Addressing claim 35, for the limitation of this claim see Figure 2 and col. 6:6-13.

Addressing claims 36 and 38, note that these claims only provides an intended use limitation that unless shown otherwise does not *structurally* modify the claimed apparatus.

Addressing claims 39-42, for the limitations of these claims see col. 5:29-33. For claim 42 note insulating body 102.

Addressing claim 44, Kakutani discloses a method for separating molecules (abstract), said method comprising: applying a voltage between a semiconductor material and a counter electrode to generate voltage potential that creates a depletion region in the semiconductor material (Figure 2; col. 5:56-63; and col. 7:52-59), wherein the semiconductor material and the counter electrode are separated by a gap that contains an electrically conductive layer that is in contact with the semiconductor material and with the counter electrode (Figure 2), wherein the eclectically conductive layer contains an admixture of a plurality of different charged analyte molecules of interest (Figure 2; col. 5:49-55; and col. 7:7-26); irradiating a location on the semiconductor material layer that corresponds to the depletion region with a photon energy source, wherein the photon energy source has sufficient energy to form electron hole pairs in the depletion region wherein the electron hole pairs are separated by the voltage potential to form a localized photopotential (Figure 2; col. 6:10-38; and col. 8:16-31) and moving the location on the semiconductor material layer that is irradiated by the photon energy source to create a corresponding change in photopotential at the interface of the semiconductor material and the electrically conductive layer thereby inducing the migration of the charged analyte molecules (Figure 2 and col. 8:32-46).

Addressing claims 48 and 51, for the limitations of these claims see col. 6:10-38 and col. 7:7-43.

Addressing claim 49, the insulating solvent (col. 5:49-55) will resist movement of the toner molecules.

Addressing claim 55, for the limitation of this claim see col. 8:32-46.

Addressing claim 56, Kakutani discloses "laser beams," which implies an array of light beams. See col. 6, line 29. Also see col. 7:27-43.

Claim Rejections - 35 USC § 103

19. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

20. Claims 50, 53, and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kakutani et al. (US 5,151,741) ("Kakutani").

Addressing claim 50, Kakutani discloses a method for separating molecules (abstract), said method comprising: applying a voltage between a semiconductor material and a counter electrode to generate voltage potential that creates a depletion region in the semiconductor

material (Figure 2; col. 5:56-63; and col. 7:52-59), wherein the semiconductor material and the counter electrode are separated by a gap that contains an electrically conductive layer that is in contact with the semiconductor material and with the counter electrode (Figure 2), wherein the eclectically conductive layer contains an admixture of a plurality of different charged analyte molecules of interest (Figure 2; col. 5:49-55; and col. 7:7-26); irradiating a location on the semiconductor material layer that corresponds to the depletion region with a photon energy source, wherein the photon energy source has sufficient energy to form electron hole pairs in the depletion region wherein the electron hole pairs are separated by the voltage potential to form a localized photopotential (Figure 2; col. 6:10-38; and col. 8:16-31) and moving the location on the semiconductor material layer that is irradiated by the photon energy source to create a corresponding change in photopotential at the interface of the semiconductor material and the electrically conductive layer thereby inducing the migration of the charged analyte molecules (Figure 2 and col. 8:32-46).

Although Kakutani does not mention alternating the applied voltage potential to "cause the motion of the charged analyte molecules to alternate between the semiconductor material and the counter electrode" it would have been obvious to one with ordinary skill in the art at the time of the invention to do so because then different images can be created. In other words, the claimed alternating of the applied voltage would just allow the image making method of Kakutani to be practiced again with the same apparatus.

Addressing claim 53, Kakutani discloses a method for separating molecules (abstract), said method comprising: applying a voltage between a semiconductor material and a counter

electrode to generate voltage potential that creates a depletion region in the semiconductor material (Figure 2; col. 5:56-63; and col. 7:52-59), wherein the semiconductor material and the counter electrode are separated by a gap that contains an electrically conductive layer that is in contact with the semiconductor material and with the counter electrode (Figure 2), wherein the eclectically conductive layer contains an admixture of a plurality of different charged analyte molecules of interest (Figure 2; col. 5:49-55; and col. 7:7-26); irradiating a location on the semiconductor material layer that corresponds to the depletion region with a photon energy source, wherein the photon energy source has sufficient energy to form electron hole pairs in the depletion region wherein the electron hole pairs are separated by the voltage potential to form a localized photopotential (Figure 2; col. 6:10-38; and col. 8:16-31) and moving the location on the semiconductor material layer that is irradiated by the photon energy source to create a corresponding change in photopotential at the interface of the semiconductor material and the electrically conductive layer thereby inducing the migration of the charged analyte molecules (Figure 2 and col. 8:32-46).

Although Kakutani does not mention applying the photon energy intermittently, if not implied, it would have been obvious to one with ordinary skill in the art at the time of the invention to do so because then the appropriate LED can be switched on (for correct toner type selection) or so that the photon energy can be directed to the correct image forming portion without energizing toner of a type or in a location not of interest (col. 6:10-37).

Addressing claim 54, although Kakutani does not mention applying a reversing potential

"between the semiconductor material and the counter electrode when the photon energy source is in a light off cycle" it would have been obvious to one with ordinary skill in the art at the time of the invention to do so because then different images can be created. In other words, the claimed alternating of the applied voltage would just allow the image making method of Kakutani to be practiced again with the same apparatus.

Allowable Subject Matter

21. Claims 43 and 47 would be allowable if rewritten to overcome the rejections under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

22. The following is a statement of reasons for the indication of allowable subject matter:

a) Claim 43: the combination of limitations requires the counter electrode insulating material to be "selected from the group of materials consisting of glass and quartz." In Kakutani the insulating material is made from polyethylene terephthalate. See col. 5:29-33; and

b) Claim 47: the combination of limitations requires the film to comprise "an admixture of a composition selected from the group consisting of polyacrylamide, dextran,

polymethyl methacrylate and agarose." In Kakutani the film comprises an admixture of various types of toner molecules and an insulating solvent, such as kerosene. See col. 5:49-55.

Final Rejection

23. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX NOGUEROLA whose telephone number is (571) 272-1343. The examiner can normally be reached on M-F 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NAM NGUYEN can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alex Noguerola
Primary Examiner
AU 1753
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